

rapidly when the distance from the film exceeded 5 mm. The dried juice retained the action with undiminished effect for months. When the dried films were heated from 150° C. to 200° C. they charred, but did not lose their action on the plate. As the temperature was raised further the power of affecting the plates was diminished, as the ash of the juice became white. Even the white ash had a slight action on the plate (potassium salts).

The introduction of screens between the film and the photographic plate led to notable results. The interposition of tissue paper slightly delayed the action on the photographic plate. Thick black paper (0.13 mm.) employed by the makers to enclose photographic plates, and found by us impenetrable to the rays from phosphorescent salts, served only to delay the time in which an image of a definite intensity was formed. The effect was produced through a celluloid screen (0.07 mm.) and through paraffined paper (0.03 mm.). We were unable to obtain screens of glass or mica less than 0.02 mm. in thickness. These screens completely protected the plates from action by the film. Screens of aluminium foil 0.002 mm. thick made no alteration in the intensity of the image of the film. When eight layers of the aluminium foil were superimposed, the density of the image on the plate was increased.

Examination of the dried material with a zinc sulphide screen failed to show any scintillations due to the  $\alpha$  particles.

When a rapid current of dried air was passed obliquely between the plate and the film at a rate of 300 c.c. per minute the image of the letters on the film was sharp and well defined. The distance between the plate and the film was 0.5 mm. Any gas or emanation would have been carried along by the current, especially any gas having such a slow action on a photographic plate.

H. G. CHAPMAN.  
J. M. PETRIE.

University of Sydney, May 3.

### Musical Sands of Eigg.

SINCE Hugh Miller's brief reference ("The Cruise of the *Betsey*") to the musical sands of the Bay of Laig, Isle of Eigg, much has been done with these, and sands of a similar character, to enable us to account for the cause of the phenomenon; and the interest taken by physicists in certain experiments which I conducted some years ago induces me to offer the results of some further observations for publication.

There is no musical sand in the Bay of Laig, and, so far as I can ascertain, its sands have never been musical within the memory of any inhabitant of the island. At the present time the psammological conditions are such as to preclude entirely the possibility of its existence there.

In a small bay—about a mile and a half along the shore to the north of Laig Bay—known as Camas Sgiotaig, musical sands occur. This bay is divided into two portions by a reef of calcareous sandstone jutting out from the cliffs seawards. In both portions, but especially close to the cliffs, a white quartzose sand has accumulated, and this is the only place where musical sands are found in Eigg.

The sands are derived from the waste of the calcareous sandstone referred to. In places the grains have accumulated in small rifts and cavities in the rocks, and in all such it was found to be equally musical, showing that long, flat stretches of sand are not essential conditions for the selective action of the winds and sea-waves.

The usual experiments with various vessels and plungers, &c., were carried out *in situ*, and the musical effects were in all cases much more pronounced than those produced by the Studland Bay sand.

An extraordinary volume of sound was obtained by dragging the convex part of a wooden bowl along the surface of the sand patches, one of which was only about 6 feet square. When the same bowl was partially filled, and the sand struck with a wooden plunger, it emitted a noise like the deep bark of a dog, and this could be heard for a considerable distance along the shore.

These musical sands are only found in calm weather; in the winter the huge waves carry away all fine matter, and

only the rocks remain—for which reason we must regard it as a fine-weather phenomenon in this island.

Eigg, June 6.

CECIL CARUS-WILSON.

P.S.—Since the posting of my letter respecting the musical sands of Eigg, I have read the letter from Mr. Thomas which appeared in NATURE of June 8.

Prof. Poynting, I think, informed me of the occurrence of these sands at Barmouth some time ago, and I have found them also at Penally, near Tenby, at Longland Bay, and in Swansea Bay.

I have frequently pointed out that the pitch of the notes emitted from musical sands depends (a) upon the size of the grain, (b) the area of the plunger's striking surface, and (c) the form and composition of the vessel used. In some vessels of particular form I have succeeded in producing from the same mass of sand, and during the one thrust of the plunger, notes of both high and low pitch!

The vessel containing the sand is first well shaken in order that the smaller grains may settle at the bottom of the mass and the larger ones at the top. The plunger is then thrust sharply upon the surface, and coming first in contact with the larger grains, it produces a low note; this merges into a note of higher pitch as the plunger penetrates the mass and reaches the finer grains at the bottom of the vessel.

As a matter of fact, the notes from all natural musical sands appear to be a cumulative effect due to a combination of high and low pitch within a given range. The only sand which seems to emit a pure and definite note is that which I have produced artificially.

June 10.

C. C.-W.

### Botanical Research in Ceylon.

THE letter from Cambridge with the above title, which appeared in your issue of May 25, has evidently been written without knowledge of the difficulties which have arisen at Peradeniya within the last few years and under a complete misapprehension of my views.

The letter reproduces, without the context, a single sentence from a memorandum of mine. In this memorandum special stress is laid on the importance of maintaining Peradeniya as a centre of botanical research, and it is suggested that Dr. Willis should remain as its director under such conditions as would allow of his conducting botanical investigations which in recent years he has found it impossible to undertake.

The letter seeks chiefly to justify Dr. Willis's position as a botanist, which has not been called in question. Neither have the services which Peradeniya has rendered to the botanical workers who have visited it been questioned.

The sentence quoted from my memorandum refers to the two principal members of the staff and the difficulties which admittedly have rendered botanical research impossible for them owing to the pressure of other work.

My suggestion, as a solution of the difficulties which have arisen, was to maintain Peradeniya "as a great reference garden and centre for botanical research in the tropics"—to reproduce my own words—distinct from, though cooperating with, the Agricultural Department which the Government of Ceylon, most wisely, now desires to establish. Whilst I should have preferred this solution, I am satisfied that the decision to incorporate the Royal Botanic Gardens at Peradeniya with the Agricultural Department will secure what the colony chiefly needs in the interests of tropical agriculture, for the advancement of which the whole community, European and native, is so deeply concerned.

WYNDHAM R. DUNSTAN.

June 3.

### The Extinction of the Egret.

It will be remembered by those who are interested in the protection of the white heron that the feather dealers have urged that the breeding haunts, or garzeros, of these birds are guarded, and that the moulted feathers are picked up from the ground. From information which has been sent to me from the National Association of Audubon Societies, based on the sworn testimony of a man who

has been personally engaged in feather collecting in Venezuela, it appears that while a few moulted feathers, worth possibly a fifth of the value of those taken from living birds, are collected, there is not the slightest foundation for the statement that the breeding places are protected for the purpose.

Mr. A. H. Meyer, who has come forward, adds the following to his account:—"The natives of the country, who do virtually all the hunting for feathers, are not provident in their nature, and their practices are of a most cruel and brutal nature. I have seen them frequently pull the plumes from wounded birds, leaving the crippled birds to die of starvation, unable to respond to the cries of their young which were calling for food in the nests above. I have known these people to tie and prop up wounded egrets on the marsh, where they would attract the attention of other birds flying by. These decoys they keep in this posi-

#### THE NATIONAL EXPERIMENTAL TANK.

TO the present-day shipbuilder or shipowner there are probably no more important problems than those of getting the best or least wasteful form of hull with the limitations of dimensions imposed by its service or internal arrangements, and of obtaining a trustworthy forecast of the power required to propel a ship of that form at a given speed.

It is the exhaustive investigations of such problems as these which constitutes the primary object of an experiment tank. Such a tank is to the naval architect what the research laboratory is to the chemist, or the testing house to the engineer. Forty years ago model experiments were looked upon as "remote from practical use," and it was largely due to the fertile



FIG. 1.—National Physical Laboratory Experimental Tank. View looking North (empty).

tion until they die of their wounds or from the attacks of insects. I have seen the terrible red ants of that country actually eating out the eyes of these wounded, helpless birds that were tied up by the plume hunters."

The story that the aigrettes used in the feather trade are picked up on the ground in Venezuela is stated by those interested to have been based on a letter written by Mayeul Grisol, naturalist and explorer of the Honorary Mission of the Museum of Natural History of Paris. Prof. Osborn, president of the American Museum of Natural History, recently sent the following cablegram to the Museum of Natural History of Paris:—

"Is Mayeul Grisol of scientific standing? Has he been an accredited explorer for your museum to South America?"

This is the answer:—"Mayeul Grisol unknown."

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brain and the carefully conducted epoch-making experiments of the late Dr. William Froude that this impression has been removed, and replaced by a continually growing confidence in the application of the results of experiments with models to the full-sized ship.

Many early investigators, amongst whom may be numbered Bernouilli and Euler, attempted to solve the problem of least resistance mathematically.

Later on, in 1770, experiments on a small scale were made by D'Alembert, Abbé Bossut, and Condorcet, and an attempt was made to frame formulae for forms of least resistance. These were followed by M. Romme, and later by Marc Beaufoy, who for five years (1793 to 1798) made experiments with various models in the Greenland Dock. Unfortunately, owing